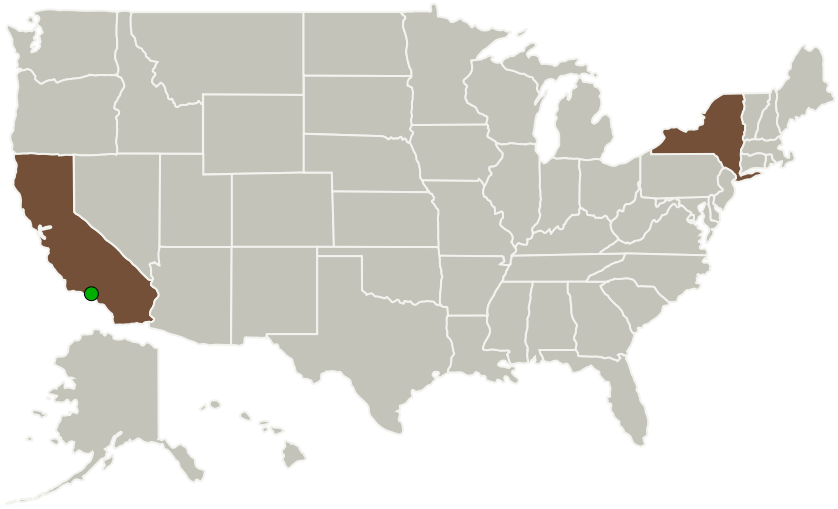
High Temperature Stirling Cooler, Phase I

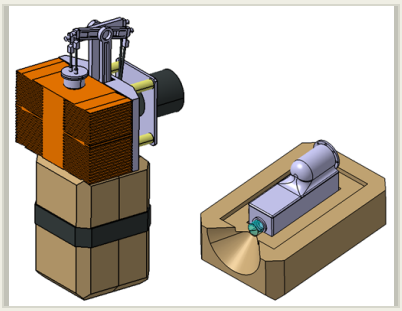
Completed Technology Project (2017 - 2018)

Project Introduction

Although Honeybee and others have made huge advances in developing mechanisms, motors, and electronics for use in high temperature/high pressure environments such as the surface of Venus (460C), certain types of critical electronic and sensing technologies are inherently temperature sensitive. The lack of high temperature tolerat cameras and optical sensors has, to date, prevented up-close in-situ analysis of the Venusian surface. In this SBIR we will close that technology gap by developing a miniature Stirling cooler, suitable for integration with a sensor package at the end of an effector or robot arm, which is capable of keeping conventional electronics cool outside of the spacecraft body in the high temperature Venus environment. This advance would vastly expand the list of technologies which can be deployed on the surface of Venus, and correspondingly advance the types of science that can be performed. We will demonstrate in Phase-I a brassboard system at high temperature, followed by a flight like system in full Venusian conditions in Phase-II.

Primary U.S. Work Locations and Key Partners





High Temperature Stirling Cooler, Phase I Briefing Chart Image

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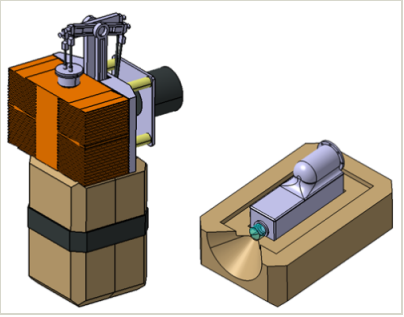
Organizations Performing Work	Role	Type	Location
Honeybee Robotics, Ltd.	Lead Organization	Industry	Pasadena, California
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	New York

Images



Briefing Chart Image
High Temperature Stirling Cooler, Phase I Briefing Chart Image *(https://techport.nasa.gov/image/126719)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Honeybee Robotics, Ltd.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

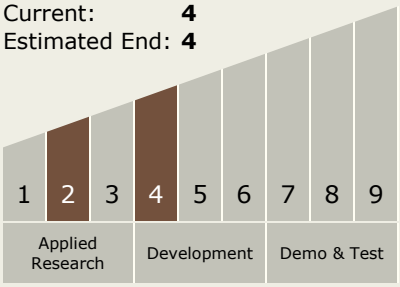
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Andrew Maurer

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX04 Robotic Systems
  - TX04.1 Sensing and Perception
    - TX04.1.3 Onboard Mapping and Data Analysis

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System